



Competition for Promoting Electric Propulsion

Project Description:

Funded by the Office of Naval Research, The American Society of Naval Engineers has tasked us to design and build an aquatic vessel propelled by electrical propulsion. The goal of this competition is to bring awareness to electric propulsion research to decrease reliance on fossil fuels and minimize marine noise pollution. Vessel must be designed for reliability, as most vehicles fail in endurance testing. Vehicle will be designed with redundancies



Design Considerations:

Hull

- Manned vs. Unmanned

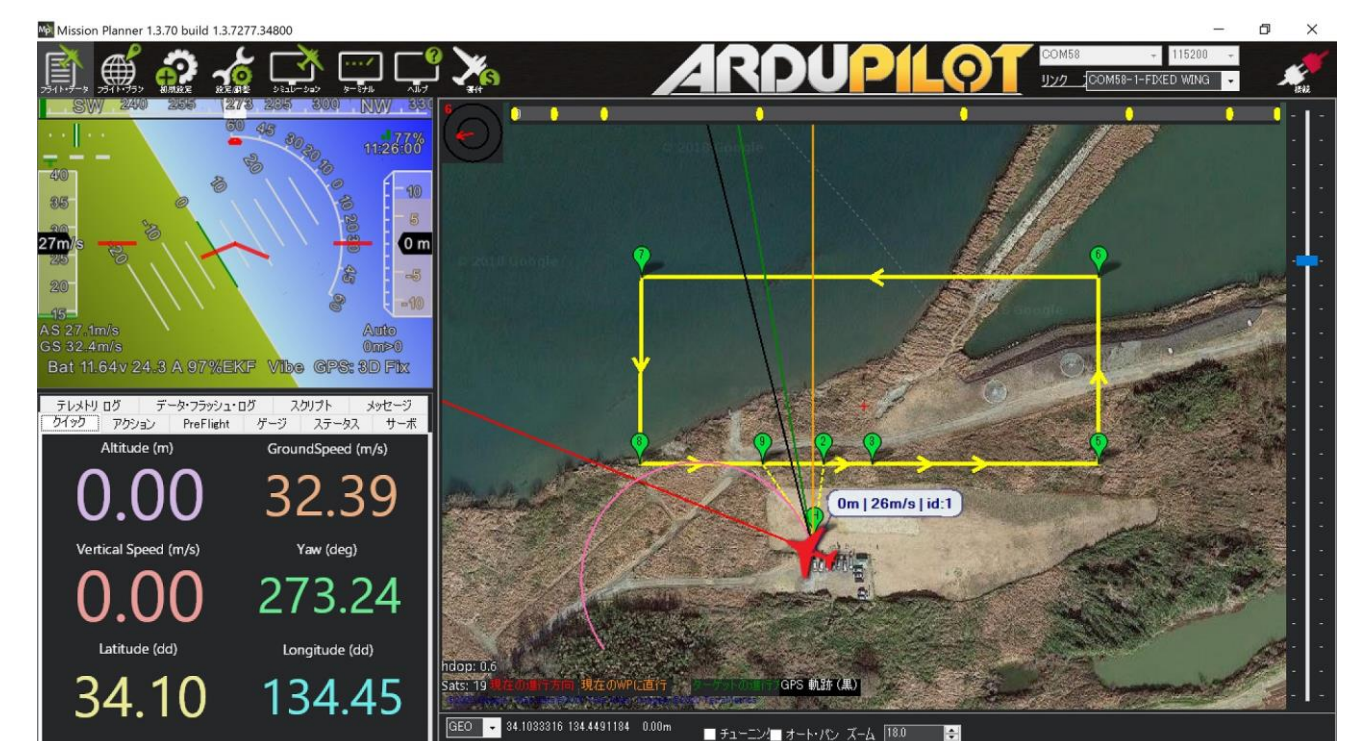
Different Hull Types Explained		
Hull Shape	Hull Design & Type	Pros & Cons
	Round-Bottomed Hulls Displacement hull Sailboats, canoes	Handles well in rough water Tends to roll, can capsize Has maximum hull speed
	Multihulls Displacement hull Sailboats, catamarans	Extremely stable & faster Handles well in rough water Large turning radius
	Flat-Bottomed Hulls Planing hull Rowboats, skiffs, tug boats	Extremely stable Extremely choppy & wet No good for bluewater
	V-Shaped Hulls Planing hull Powerboats	Faster Handles less well in waves Requires more power
	Pontoon Hulls Planing hull Pontoon boats	Stable Not agile No good for bluewater

Hull Types Cr: Improve Sailing

- Planning to source hull second-hand for repurposing
 - In-house fabrication of fiberglass hull as alternative



ASNE PEP Competition



ArduPilot Mission Planner Interface

Propulsion

- Electric thrusters
- Inboard motor with shaft-driven propeller
- Servo-controlled outboard motor



Blue Robotics T500 Thruster

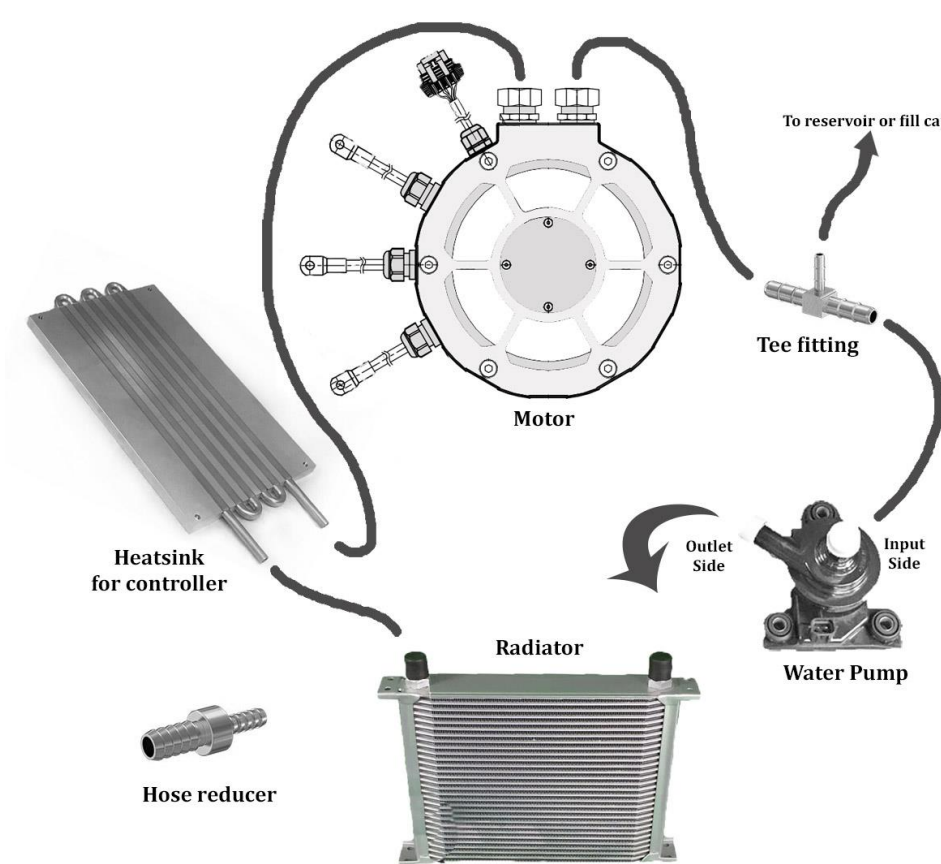


Remote Control

- 4-8 Channel Remote Controller
 - Channels for each motor
 - Channels for possible rudder and auxiliary systems (camera gimbals, controllable outrigger pitch)
- Potential for autonomous control using Ardupilot Mission Planner

System Cooling

- Heat from 5-mile endurance race will be problematic
- A pumped-water cooling system will be required to adequately cool motors and other electrical components within the enclosed space of the vessel's hull



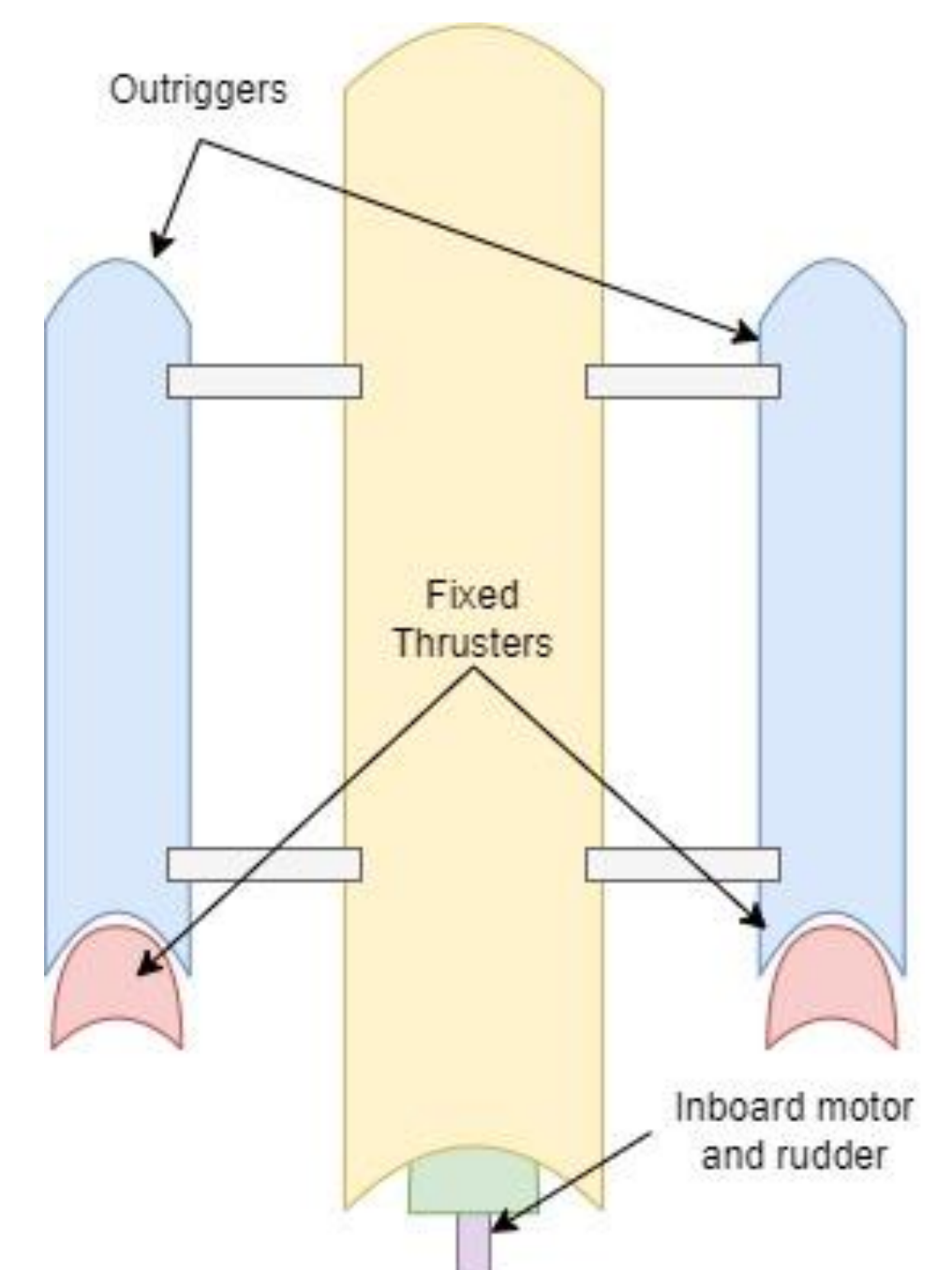
Thunderstruck Motors Liquid Cooling System

Energy Storage

- Banks of LiPo batteries
 - Enough energy density and demand capacity to meet requirements of propulsion, electronics, cooling system, and any auxiliary systems
- Likely use of multiple 6000 mAh 4s 100c batteries

Potential Solution:

- Unmanned trimaran hull with fixed thrusters. Utilizing thrust vectoring will allow for reduced mechanical complexity and thus increase reliability
- A conventional motor/propeller configuration on the main hull will also be utilized for redundancy and power
- Battery banks throughout main hull for weight distribution



Deliverables:

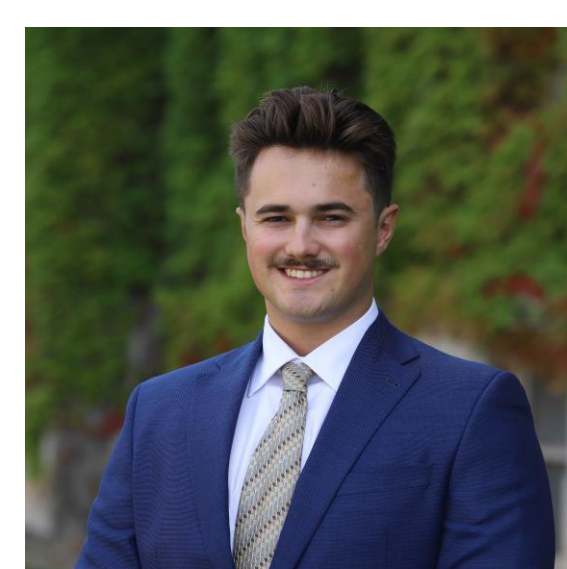
- Robust hull design (4-8ft in length)
- Reliable and redundant propulsion system
- Control system design and integration
- Prototype testing
- ASNE PEP whitepaper and design report
- Participation in ASNE competition in April 2024



Faculty Mentor: Prof. Kasey Laurent



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